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Master-modes of the 3D turbulent channel flow MAKSYM BONDARENKO, SERGEI CHERNYSHENKO, University of Southampton — Using Chebychev-Fourier representation of Direct Numerical Simulation solution we determine the so-called master modes, that is those modes which contain all essential information about the flow. The method used by E. Olson and E.S. Titi for 2D case is applied for 3D turbulent channel flow (i.e. Determining modes for continuous data assimilation in 2D turbulence, Journal of Statistical Physics, 113 (2003), 799-840). Initial simulation performed with 32786 Chebychev-Fourier modes using a spatial domain with streamwise and spanwise periods of 1.6 π revealed that the number of master-modes for Re_τ=85 is $N \leq 650$. Number of master-modes is not the same as, but may be related to, the fractal dimension of the attractor. For the comparison, L. Keefe, J. Kim and P. Moin estimated the fractal dimension as D_λ=780 for Re_τ=80. (i.e. The dimension of attractors underlying periodic turbulent Poiseuille flow, J. Fluid Mech (1992), vol. 242, pp.1-29). Results for higher Re_τ will be obtained, analysed and reported at the conference. In particular we are interested in what organised structures will appear in the master modes.

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